North American Journal of Fisheries Management 15:515–517, 1995

14511

Comparison of Stationary and Mobile Electrofishing for Sampling Flathead Catfish[1]

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Abstract.—During summer 1992, I compared stationary and mobile electrofishing procedures to assess their effectiveness in sampling flathead catfish *Pylodictis olivaris* in Oklahoma reservoirs. There was no significant difference between the two methods in capture efficiency, mean C/f_H (numbers of individuals ≥510 mm total length netted per 6 min of electrofishing), and mean C/f_R (numbers of individuals <200 mm netted per 6 min of electrofishing). However, there were significant differences in C/f_H and C/f_R among reservoirs, seemingly related to habitat differences. For C/f_H, but not for C/f_R, mobile electrofishing was more effective over riprap habitat, whereas stationary electrofishing was more effective over other underwater structures. I suggest these differences can be used to increase effectiveness of flathead catfish sampling.

Interest and concerns regarding Oklahoma's flathead catfish *Pylodictis olivaris* sport fishery have steadily increased in recent years (Summers 1986). Sampling of flathead catfish in Oklahoma has traditionally been limited to incidental catches in standardized gill-net sets (Erickson 1978). However, catch rates resulting from such sampling are typically low or nil (Oklahoma Department of Wildlife Conservation [ODWC] unpublished data). In recent years, electrofishing boats held stationary 2–10 m offshore have been used effectively to collect flathead catfish (Weeks and Combs 1981; Gilliland 1988). The ODWC began using stationary electrofishing in 1991 to assess flathead catfish populations in reservoirs. However, subjective observations suggested that catch rates increased if the electrofishing boat was mobile, that is, was driven slowly along the shore. Mobile sampling has been used extensively in riverine habitats (Guier et al. 1984; Quinn 1988; Pugibet and Jackson 1991), but its use in lacustrine habitats has not been documented. The purpose of this study was to compare stationary and mobile electrofishing to assess their effectiveness in sampling flathead catfish populations in reservoirs.

[1] This is contribution 224 of the Oklahoma Fishery Research Laboratory, a cooperative unit of the Oklahoma Department of Wildlife Conservation and the University of Oklahoma Biological Survey.

Methods

Canton, Fort Gibson, Texoma, Thunderbird, and Webber's Falls reservoirs were electrofished for flathead catfish during daylight hours from May through June 1992. Morris and Novak (1968) and Weeks and Combs (1981) reported flathead catfish electrofishing was ineffective at water temperatures below 16°C; therefore, sampling was attempted only after water temperatures had reached 16°C. An electrofishing boat outfitted with a Smith-Root GPP (Smith-Root, Inc., Vancouver, Washington) set at low DC pulse rates (7.5–30 pulses/s) was used for all sampling (Quinn 1988; Gilliland 1988). Sampling stations were selected in habitat thought to harbor flathead catfish, such as rocky points, riprap, log piles, and steep undercut banks (Hale et al. 1987).

Stationary and mobile electrofishing sampling consisted of one 6-min unit of effort per station. Preliminary observations indicated catch by stationary sampling decreased after approximately 3 min. Therefore, the 6-min stationary sampling effort was evenly divided between two sites located approximately 100 m apart. With stationary electrofishing the boat was held stationary 2–10 m offshore; with mobile electrofishing the boat was slowly driven parallel to the shoreline 2–10 m offshore. A chase boat was used with both methods to locate and net surfacing flathead catfish. Both methods were used at each station; the method used first was randomly selected and was followed about 1 week later with the other method. One week was deemed sufficient to eliminate bias introduced by repeated shocking (Cross and Stott 1975).

The number of individuals observed and the number and total lengths of individuals netted were recorded. Capture efficiency was expressed as the percentage of fish observed that were also netted. Objectives of ODWC sampling procedures for flathead catfish are to monitor numbers of harvestable-sized individuals (Oklahoma has a 510-mm statewide minimum length limit on flathead catfish) and recruitment to age 1. Thus, catch rates were expressed as the number of individuals 510

TABLE 1.—Catch of flathead catfish of two total length groups collected with stationary and mobile electrofishing on various reservoirs in Oklahoma, 1992. Included are number of samples (N), mean number of individuals collected per 6 min of electrofishing (C/f), coefficient of variation of the sample (CV), P values (probability that the mean difference in catch between the two sampling methods was equal to zero), and the percentage of samples taken at stations with riprap habitat.

Reservoir or habitat type	N	Stationary		Mobile		P	Stations with riprap (%)
		C/f_H	CV	C/f_H	CV		
			≥510 mm (C/f_H) total length				
All reservoirs	90	1.2	16	1.5	15	0.40	46
Canton	10	1.7	26	2.9	23	0.11	100
Fort Gibson	22	2.5	22	1.3	24	0.06	5
Texoma	20	0.8	36	2.7	24	<0.01	100
Thunderbird	17	0.6	64	1.1	46	0.50	12
Webber's Falls	21	0.7	36	0.2	40	0.06	38
Riprap	41	1.0	21	2.3	17	<0.01	100
Nonriprap	49	1.4	22	0.8	23	0.04	0
			<200 mm (C/f_R) total length				
All reservoirs	90	0.3	39	0.5	23	0.09	46
Canton	10	0.7	37	2.4	20	<0.01	100
Fort Gibson	22	<0.1	100	0.1	73	0.33	5
Texoma	20	0.1	100	0.1	69	0.33	100
Thunderbird	17	0.5	100	0.0		0.33	12
Webber's Falls	21	0.4	56	0.7	34	0.05	38
Riprap	41	0.5	42	0.9	23	0.15	100
Nonriprap	49	0.1	57	0.1	51	0.26	0

mm long or greater (C/f_H) and less than 200 mm long (C/f_R) netted per 6 min. The 200-mm ceiling was used because age-1 flathead catfish are typically 160–200 mm long in Oklahoma (Weeks and Combs 1981). The chi-square test of homogeneity was used to test if the methods had similar capture efficiencies. Wilcoxon's signed-rank test was used to test if the methods provided equivalent estimates of C/f_H and C/f_R. Statistical significance was assessed at the $P = 0.05$ level.

Results and Discussion

Generally, stunned flathead catfish surfaced within 45 s after sampling was initiated and remained on the surface for 60–90 s, similar to the responses reported by Hale et al. (1987) and Gilliland (1988). Consequently, capture of stunned individuals was difficult when several fish surfaced concurrently over a wide area. Capture efficiency was 55% with stationary sampling and 56% with mobile sampling. The two capture efficiencies did not differ significantly when data for all reservoirs were combined, nor when reservoirs were analyzed separately.

Mean C/f_Hs for the stationary and mobile sampling methods over all reservoirs were 1.2 (coefficient of variation [CV] = 16) and 1.5 (CV = 15), respectively, and did not differ significantly. However, effectiveness of mobile and stationary electrofishing varied according to lake. The C/f_H of mobile electrofishing was significantly higher than stationary sampling on Texoma Reservoir (Table 1). Although no significant differences in C/f_H were indicated for the other reservoirs, differences approached significance in Fort Gibson and Webber's Falls reservoirs, with stationary sampling being the more effective method (Table 1). Unlike Fort Gibson and Webber's Falls reservoirs, all of the stations on Texoma Reservoir were located over riprap habitat (i.e., dam and bridge embankments; Table 1). The C/f_H of mobile electrofishing was significantly higher when riprap stations were pooled, whereas C/f_H of stationary sampling was significantly higher when nonriprap stations were pooled.

Mean C/f_Rs for the stationary and mobile sampling methods over all reservoirs were 0.3 (CV = 39) and 0.5 (CV = 23), respectively. Overall, C/f_R did not differ significantly. However, effectiveness of mobile and stationary electrofishing varied according to the lake (Table 1). Unlike the case for C/f_H, no significant difference in C/f_R was indicated when riprap and nonriprap stations were pooled.

Mobile electrofishing over nonriprap habitat, such as log piles, was not as effective as stationary electrofishing for sampling flathead catfish 510 mm or greater, but was as effective for sampling fish less than 200 mm. Perhaps denser cover delayed surfacing of large stunned individuals, and these individuals were missed by the electrofishing and chase boats. Sullivan (1956) observed that electrofishing effectiveness for bullheads *Ameiurus* spp. typically decreased as fish size increased because larger individuals were associated with denser cover and took longer to surface after being stunned. Conversely, mobile electrofishing over riprap habitat was more effective than stationary electrofishing, perhaps because it sampled a larger proportion of those areas and had a greater chance of encountering flathead catfish congregated there. Flathead catfish are almost always associated with some sort of structure (Hart and Summerfelt 1974; Coon and Dames 1991), and can be particularly abundant in riprap habitat where they often spawn and are attracted to forage fish (Layher and Boles 1979, 1980).

I conclude that mobile electrofishing is a more effective method for sampling flathead catfish 510 mm and greater from riprap habitat. However, stationary electrofishing is more effective when sampling nonriprap habitat. My recommendation is that both sampling methods be used, depending on the type of habitat being sampled.

Acknowledgments

This research was funded by the ODWC through Federal Aid in Sport Fish Restoration, project F-44-D. I thank ODWC fishery management and research personnel for field assistance, and J. C. Boxrucker, J. Francis, E. R. Gilliland, R. P. Lemmons, D. B. Makauskas, L. E. Miranda, G. L. Summers, and two anonymous referees for reviewing this manuscript.

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